Mark schemes

Q1.

(a) pathogens

1

(b) viruses reproduce inside cells, damaging them

1

(c) any one from:

- they do not have a cell membrane

  do not accept they do not have a cell wall
- they do not have cytoplasm
- they do not have a nucleus
- they do not have mitochondria (like most eukaryotic cells)
- they do not have ribosomes

do not accept they do not have chloroplasts / chlorophyll

ignore they are not living / alive

ignore they can only replicate inside cells

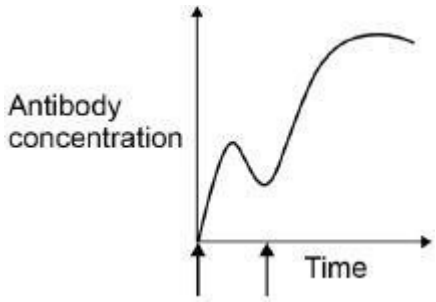
ignore virus has a protein coat

1

(d) a weakened form of a virus

1

(e)



1

(f) leaf

1

(g) y-axis labelled rate of photosynthesis in arbitrary units

1

correct scale

1

all bars plotted correctly

allow a tolerance of ± ½ small square

allow 2 correct bars for 1 mark

allow bars touching
allow any width of bars

2

all bars correctly labelled

ignore letters

1

(h) as the level of infection (with TMV) increases, (the rate of) photosynthesis decreases

allow as TMV increases, photosynthesis decreases
allow (the rate of) photosynthesis decreases as the level of infection (with TMV) increases
allow as infection gets worse, photosynthesis decreases
allow TMV reduces photosynthesis

1

(i) less chlorophyll

allow fewer chloroplasts
allow less light absorbed
ignore less photosynthesis

1

(so) less glucose / starch / protein made

1

[14]

Q2.

(a) (has) spikes / thorns / prickles

allow (has a) tough outer layer

1

(b) chemical

1

(c) the plant will not lose as much water

1

(d) chlorophyll / chloroplasts

1

(e) to allow it to photosynthesise
or
to make sugar / glucose / carbohydrate / starch

1

(f) organ

1

(g) water / mineral ions

allow named mineral ions
allow minerals / ions

1

(h) phloem (tissue)

1

[8]

Q3.

(a) will stop animals / herbivores eating it

allow it will not be eaten

1

(b) chemical

1

(c) thorns / spikes / spines / prickles (to stop animals / herbivores eating it)

1

(d) for respiration

1

to store as starch

1

(e) add Benedict's (solution / reagent to the liquid)

1

boil / heat

allow any temperature of 65 °C or above

1

(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick) red

1

(f) (nitrate ions are needed) to make proteins / amino acids

allow to make chlorophyll / DNA / ATP / nucleic acid

1

which are needed for growth / enzymes / new cells

allow correct process for named molecule in mp1

1

(g) in / on the (soil) water

allow through air (spaces) in the soil

1

(h) dosage

1

toxicity

1

(i) placebos

1

[14]

Q4.

(a) mechanical

allow physical
allow structural

1

(b) any one from:

- to deter herbivores

  ignore to injure animals, unqualified
  allow to deter animals eating it
  do not accept to deter predators

- to prevent animals damaging it

1

(c) chemical

1

(d) any two from :

- lack of magnesium (ions) (1)

  (so) not enough chlorophyll for (efficient) photosynthesis (1)

  (so) not enough glucose to make proteins for growth
  or not enough glucose to release energy for growth (1)

  allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1)

- infection by pathogen / bacteria / virus / fungus (1)

  allow correctly named pathogen
  allow has rose black spot / TMV

  (so) leaves become discoloured / yellow so less photosynthesis (1)

  allow other symptoms of named pathogens / disease

  (so) not enough glucose to make proteins for growth or not enough glucose to release energy for growth (1)

  award once only

- infected by aphids (1)

(which) remove sugars from phloem (1)

(so) not enough glucose to make proteins for growth or not enough glucose to release energy for growth (1)
award once only

- lack of (available) light (1)

(so) chlorophyll breaks down (1)

(so) not enough glucose to make proteins for growth or not enough glucose to release energy for growth (1)
award once only

5

(e) (bacteria) obtain glucose / sugar (from the plant)

1

(glucose used) for respiration or (glucose used) for making other named substances
allow (glucose used) to release energy

1

(f) (gorse plant) obtains nitrate (ions)

1

needed for amino acids / proteins
allow needed to make chlorophyll / DNA

1

(g) willow bark

1

[13]

Q5.

(a) phloem

1

(b) translocation

1

(c) either:

less (sugars for) respiration

1

(so) less energy released

1

or

less amino acids made (1)

(so) less protein produced or less protein synthesis (1)

or

less cellulose made (1)

(so) weaker cell walls (1)

(d) (aphids) can fly to another plant or part of the plant

ignore to fly unqualified

1

to get (more) food

allow to find a mate
allow idea of less competition for food
allow to escape predators
do not accept escape prey

1

(e) (oil) prevents aphids from attaching to leaf or causes aphids to slide off leaf

ignore 'the leaf is slippery'

or
idea that oil may harm / kill the aphid

allow oil may be unpleasant to the aphid

1

(f) (plant / stem has) thorns

allow spines / spikes / prickles
ignore stings
do not accept thorns protect (the plant) from predators

1

(g) C

if any other letter given then no marks for the question

1

(fungi / spores) blown by / in direction of the wind

allow black spot / disease is blown by / in direction of the wind

or
it's the closest plant (to A)

do not accept reference to bacteria / viruses / pollen being blown

1

(h) any one from:

- spread rose bushes out more

allow isolate the infected plant
allow idea of barrier around infected plant

ignore separate unless qualified

- remove any infected parts of the plant
  allow remove infected plant / A
- use a fungicide
  ignore pesticide
  do not accept insecticides / herbicide

1

[11]

Q6.

(a) a fungus

1

(b) Level 3 (5-6 marks):
Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.
Level 2 (3-4 marks):
Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.
Level 1 (1-2 marks):
Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.
Level 0

No relevant content

Indicative content

	defence	description of defence
animals	skin	sebum / oils to kill microbes dead layer difficult to penetrate
	nose	hairs keep out dust and microbes mucus traps microbes
	trachea / bronchi	cilia moves mucus
	stomach	(hydrochloric) acid kills bacteria
	white blood cells	produces antibodies produces antitoxins engulf microbes / phagocytosis
		~~tough / difficult to penetrate~~
plants	cell wall	

	waxy cuticle	tough / difficult to penetrate
	dead cells / bark	fall off, taking pathogens with them
	production of antibacterial chemicals	kill bacteria
fungi	antibiotic production	kill bacteria

6

(c) any three from:
- sterilise agar (before use)
- sterilise (Petri) dish before use
- disinfect bench (before use)
- pass inoculating loop (through flame)
- secure lid with (adhesive) tape
- minimise exposure of agar / culture to air / lift and replace lid as quickly as possible

allow:
- *dip loop into ethanol (after flaming)*
- *keep the lid on the plate for as long as possible*
  or
  minimise exposure of agar to air
  or
  only tilt the lid off (rather than remove it)
- *flame the neck of the bottle*

3

(d) to prevent the growth of a harmful pathogen

1

[11]

Q7.

(a) stinging hairs / can sting

1

(so) this harms herbivores / stops animals eating them

1

(so) less of the plant is removed / damaged

1

(b) clove (oil)

1

it has the largest areas with no bacteria growing

allow largest inhibition zone or *description of largest inhibition zone*

1

(c) antibiotics were not tested

1

[6]

Q8.

(a) A

1

(b) D

1

(c) use the same type of plant
or
give equal amount of water to each plant
ignore size of pot

1

(d) (advantage) more minerals

1

(disadvantage) cost / not free

1

[5]

Q9.

(a) to kill virus
or
to prevent virus spreading

1

(b) take (stem) cells from meristem
or
tissue culture
allow take cuttings

1

(c) use Benedict's solution

1

glucoses turns solution blue to orange

1

(d) Level 2 (3–4 marks):
A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain why plants with TMV have stunted growth.
Level 1 (1–2 marks):

Simple statements are made, but not precisely. The logic is unclear.
0 marks:

No relevant content.
Indicative content

- less photosynthesis because of lack of chlorophyll
- therefore less glucose made

so
- less energy released for growth
- because glucose is needed for respiration
- and / or
- therefore less amino acids / proteins / cellulose for growth because glucose is needed for making amino acids / proteins / cellulose

4

[8]

Q10.

(a) compare them to (pictures in) a gardening manual / website

1

send to laboratory (for testing)

1

(b) (nitrate) stunted growth

1

(magnesium) yellowing of leaves

allow chlorosis

1

(c) (fertiliser S)

has most nitrogen for good growth

if no other marks awarded allow 1 mark for (fertiliser s) has more minerals than compost

1

(and) has high(est) potassium content for stronger roots

1

(it is also) cheaper than fertiliser T

1

(however) has less phosphate than fertiliser T (although more than compost) so flowers / fruit perhaps less important for the gardener

1

[8]